

inkMaths

ANSWER BOOK

Simultaneous equations and inequalities

Algebra and functions · Year 12–13

6 questions · 20 marks

NAVY EDITION

SECTION A · Warm-up

- A1** Adding the equations kills y : $3x = 9$, so $x = 3$, and then $y = 1$ from either equation. [2]
Substituting the pair into both lines is the one-line check the answer deserves.
- A2** Factorise: $(x - 4)(x + 3) \leq 0$, with roots -3 and 4 . An upward parabola is below the axis between its roots, so $-3 \leq x \leq 4$. The sketch is the argument: quote the roots, then read the sign from the shape.

SECTION B · Standard

- B1** Equate: $x^2 - 3x + 4 = x + 1$, so $x^2 - 4x + 3 = 0$, which factorises as $(x - 1)(x - 3) = 0$. Then $x = 1$ gives $y = 2$ and $x = 3$ gives $y = 4$: the points $(1, 2)$ and $(3, 4)$. Answers come in matched pairs, and pairing them wrongly costs the marks.
- B2** Substituting: $x^2 = 2x + c$, so $x^2 - 2x - c = 0$. Tangency means one repeated root, so the discriminant vanishes: $4 + 4c = 0$ and $c = -1$. The discriminant of the substituted quadratic is geometry in disguise: two roots crossing, one touching, none missing.
- B3** Multiplying by x flips the sign for negative x , so multiply by x^2 instead, positive for every $x \neq 0$: $2x \geq x^2$, so $x^2 - 2x \leq 0$ and $x(x - 2) \leq 0$, giving $0 \leq x \leq 2$. Check both branches: $x = 1$ gives $2 \geq 1$, true; $x = 3$ gives $2/3 \geq 1$, false; $x = -1$ gives $-2 \geq 1$, false. The naive multiplication would have kept the negative branch by mistake.

SECTION C · Stretch

- C1** Factorise: $(x + 5)(x - 3) \geq 0$, roots -5 and 3 . An upward parabola is on or above the axis outside its roots, so $x \leq -5$ or $x \geq 3$: in set notation, $\{x : x \leq -5\} \cup \{x : x \geq 3\}$. The two pieces need the union symbol, not a comma: they are separate stretches of the number line with a gap between.